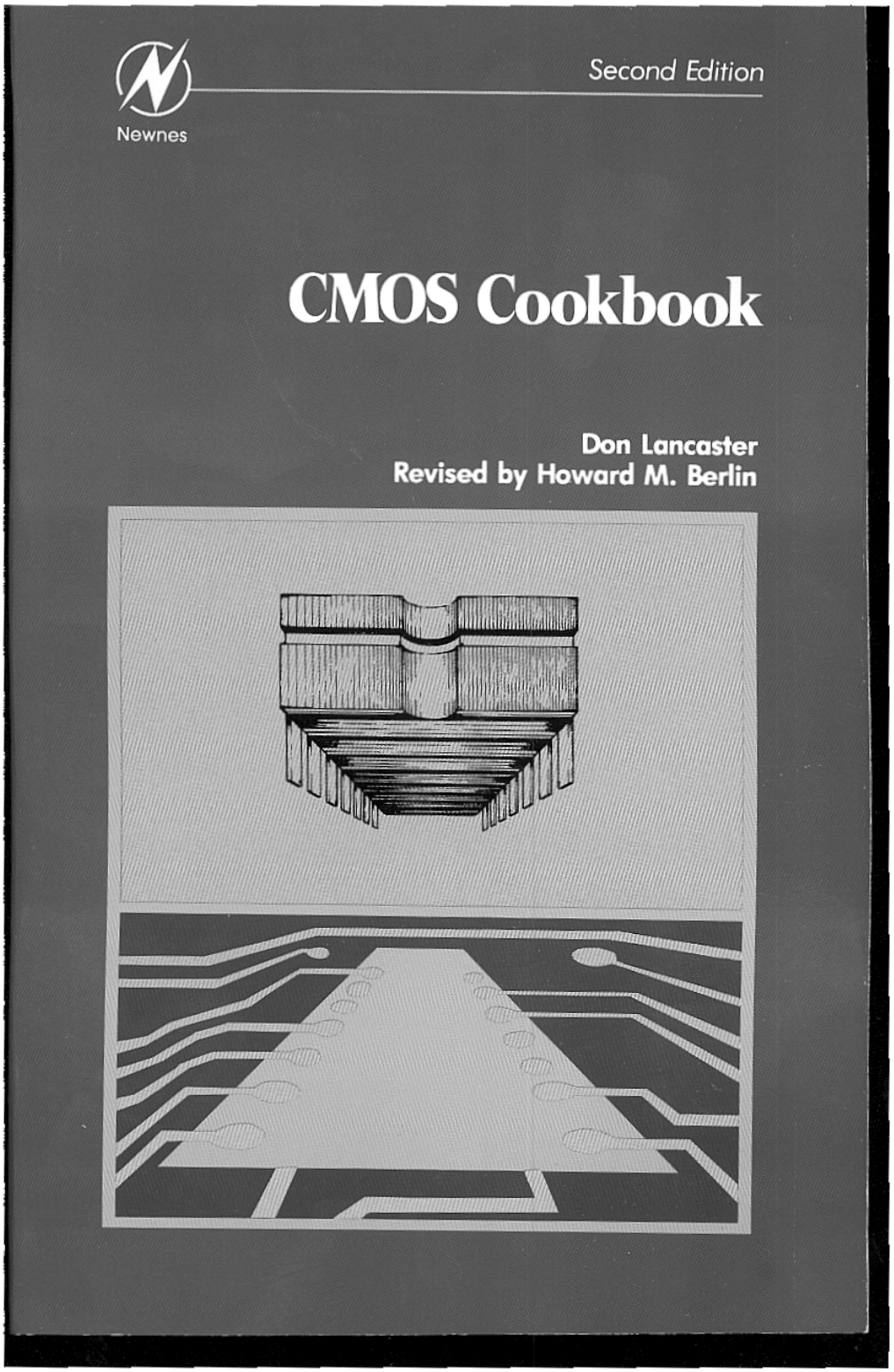
Jameco Part Number 39221



Jameco Part Number 39221

Contents

PREFACE ix

CHAPTER 1

SOME BASICS 1

The CMOS Process 3-CMOS Features 11-Logic and Transmission Gates 11-Sources 14-Pins and Packages 15-CMOS Families 17 -Input Protection 20-Power Supplies 22-CMOS Usage Rules 26 -Mounting and Breadboarding 27-Testing and Monitoring States 35-Interface 37-Tools 47-"Bad" and "Burned-Out" ICs 48-Some Conventions 48

CHAPTER 2

SOME CMOS INTEGRATED CIRCUITS 51

Numeric Index 53-Function Index 57

CHAPTER 3

LOGIC 223

CMOS Logic Gates as Simple Switches 224-State Definitions: What Is a Zero 225_The One-Input Logic Gate 226_The Two-Input Logic Gate 227_Other Two-Input Gates 237_More Inputs 238_A Trick Called DeMorgan's Theorem 239_Transmission-Gate Logic (TGL) 240_Mickey-Mouse Logic (M2L) 242_TRI-STATE(R) Logic 245_Advanced Logic Techniques 248_Data-Selector Logic 249

Jameco Part Number 39221

CHAPTER 4

MULTIVIBRATORS 255

Bistable Circuits 256_Schmitt Triggers 265_Astable Circuits 269_Crystal Oscillators 279_Voltage-Controlled Oscillators 287_Monostable Circuits 292_The CMOS 555 Timer 297_The 4047 Multivibrator 304_Duty-Cycle Integrators 307_Some Guidelines 310

CHAPTER 5

CLOCKED LOGIC: JK AND D FLIP-FLOPS 313

CMOS Clocked Logic 314_A Clocked-Logic Block 315_An Alternate-Action Push Button 317_A Master-Slave Clocked Logic Block 317_Direct Inputs 320_The 4013 Dual Type-D Flip-Flop 321_The 4027 Dual JK Flip-Flop 323_An Applications Catalog 325

CHAPTER 6

COUNTERS AND SHIFT REGISTERS 349

Counter Qualities 349_Some CMOS Counters 353_Some Counter Applications 356_Shift Registers 366_Digital Sine-Wave Generators 379_Some Fine Print 385

CHAPTER 7

OP AMPS, ANALOG SWITCHES, AND PHASE-LOCKED LOOPS 389

CMOS Operational Amplifiers 390_CMOS Analog Switches 403_CMOS Phase-Locked Loops 413

CHAPTER 8

DIGITAL DISPLAYS 427

Interfacing Lamps and LEDs 427_7-Segment LED Displays 429 _Display Drivers 431_Obtaining BCD Information from 7-Segment Displays 435_Liquid-Crystal Displays 438

CHAPTER 9

IC MEMORIES AND PROGRAMMABLE LOGIC ARRAYS 441

What Is a Memory? 442_Basic Memory Organizations 442_The 1K Convention 443_Input/Output Connections 443_Read-Only Memories 445_ROM Storage 449_Random-Access Memories 453 _Programmable Logic Arrays 455_Some Examples 457

Jameco Part Number 39221

CHAPTER 10

GETTING IT ALL TOGETHER 463

Multiplexed Digital Displays 464_A Digital Wristwatch 467_A Multimode Stopwatch 468_A Frequency Counter 470_Four-In-One Video Game 472_The CMOS Microlab 476_Bit-Boffer Digital Cassette Recorder 479_The CMOS Music Modules 482_TVT-4 TV Typewriter 485_3 1/2-Digit A/D Converters 489_Some Challenges 494

APPENDIX A

TTL TO CMOS CONVERSION TABLE 499

APPENDIX B

SOME PRODUCT SOURCES 503

INDEX 505

Jameco Part Number 39221

CMOS Cookbook

The CMOS Cookbook contains all you need to know to understand and successfully use CMOS (Complementary Metal-Oxide Semiconductor) integrated circuits. Written in a "cookbook" format that requires little math, this practical, user-oriented book covers all the basics for working with digital logic and many of its end applications.

Whether you're a newcomer to logic and electronics or a senior design engineer, you'll find CMOS Cookbook and its examples helpful as a self-learning guide, a reference handbook, a project-idea book, or a text for teaching others digital logic at the high school through university levels.

In the pages of this revised edition, you'll discover:

- What CMOS is, who makes it, and how the basic transistors, inverters, and logic and transmission gates work
- CMOS usage rules, power-supply examples, and information on breadboards, state testing, tools, and interfacing
- Discussions of the latest CMOS devices and sub-families, including the 74C, 74HC, and 74HCT series that streamline TTL and CMOS interfacing
- An in-depth look at multivibrators -- including astable, monostable, and bistable -- and linear techniques
- Clocked-logic designs and the extensive applications of JK and D-type flip-flops
- A helpful appendix featuring a TTL-to-CMOS conversion chart

Don Lancaster heads Synergetics-Arizona, an electronics design and consulting firm. He is the author of many, best-selling books, including *TTL Cookbook, Active-Filter Cookbook*, and *AppleWriter™ Cookbook*.

Howard M. Berlin is president of Howard M. Berlin Limited, a Delaware-based consulting firm. He has taught courses for the United States Army, several universities and colleges, and industrial firms. He has written numerous governmental reports and articles for scientific, numismatic, and amateur radio journals and magazines. In addition he is the author of more than fourteen books, including ***The 555 Timer Applications Sourcebook with Experiments, Design of Op-Amp Circuits with Experiments, and Design of Phase-Locked Loop Circuits with Experiments.***

ISBN 0-7506-9943-4